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THOS. H. McCOLLIN, Managing Editor.

JULIUS F. SACHSE, Editor.

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WHAT DEVELOPER SHALL I USE?

A VISIT to the convention and a careful study of the photographic gems exhibited there, is apt to raise the question in the minds of many visitors, both professional and amateur, as they stop to admire some of the exquisite specimens shown: "Wonder what plate he uses, or what developer he works?"

The first of these questions is usually answered gratuitously, by either placard or catalogue, stating the brand as well as sensometer. Thus this part of the problem becomes an open secret, and so far as the plates are concerned all photographers are upon an equality. The special brand of plates upon which the negative of the medal winner was made is at the disposal of every individual photographer in the country. The same is true as to the kind of paper upon which that particular photograph was printed.

These facts are at once seized upon by the makers of both plate and paper, who without delay turn the success of the medal winner into an advertisement for their specialty.

Now it frequently happens, we may say in almost every case, that some unsuccessful exhibitor, as well as the interested visitor, has used these identical plates and papers over and over again, with much inferior results. In his own mind he is satisfied that in many cases his own skill and judgment in lighting and timing

are fully equal to his successful competitors, and as both plates and paper are the same, he naturally comes to the conclusion that the cause for the difference between the beautiful results before him and his own failures must be caused by one or more of the chemical manipulations used during the process.

The first thought that arises in the connection is: "What does he use to develop his plates, to get those high-lights and shadows, and what is the formula?" Then again the thought arises whether these effects could be the result of some of the new developers.

These questions, if asked, are rarely answered intelligently, as almost every photographer has his own special formula adapted to his requirements.

It is certain, however, if a canvass were made at any of the larger conventions or exhibitions, the fact would undoubtedly be disclosed that ninety-five out of every one hundred exhibiting photographers develop their plates, and owe their success, to the old reliable stand-by, "pyro." And right here it will be well to state that so far as dry-plate photography is concerned, there is no effect in the whole range of tone gradation from the softest flesh tint down to the hardest chalk and charcoal effect that cannot be brought out with an intelligent and scientific use of pyro. This is merely repeating a fact known to every intelligent professional and photo-scientist upon both continents.

The writer does not wish to be understood to mean that there are no other reducing agents that will give results equal to pyro. In some special lines this is not to be denied. But it is desired to impress upon the fraternity at large the fact that results can be obtained with pyro equal to any of the newer developers.

When we come to consider the printing qualities of the negative, pyro again stands pre-eminent, far above all its modern rivals. Of course to obtain various results and effects desired, the pyro developer has to be compounded with intelligence, so as to meet each and every case. The rule of thumb will not answer where fine results are wanted. The same proportions of pyro and alkali will not answer for black and white and portrait work.

There is no such thing in practical photography as a universal formula for a pyro developer. Strength and proportions have to be adjusted to meet the requirements of the subject, and the effects wanted. Further, it is absolutely necessary for the operator to know the exact strength of the solution with which he is working, mainly as to the amount of alkali. This is an easy matter to determine, as all pyro developers are alkaline. All that is required is to have a hydrometer handy to test the solution before using it, and be guided by the reading of that instrument.

The method pursued by the writer in an experience covering almost most the whole range of photographic possibilities, is to make up three stock solutions.

No. I.

Pyro,	1 oz.
Oxalic acid,	60 gr.
Citric acid,	60 gr.
Distilled water,	16 oz.

No. II.

Sulphite of soda,	1 lb.
Carbonate of soda,	1 lb.
Water,	64 oz.

No. III.

Bromide potassium,	60 gr.
Water,	1 oz.

For use, take No. II, 4 ounces; add sufficient water to bring the solution up to from 2° to 4° test, according to the character of negative wanted: of this dilute solution take 10 oz.

No. I, 3 to 5 drachms, according to the density wanted.

No. III, 5 drops.

Greater density is easily obtained by the addition of pyro stock solution No. I.

To accelerate or obtain softer detail add dilute stock solution No. II, and use minimum proportion given for No. I.

For instantaneous exposures, place negative in a bath of dilute No. II for a few minutes before developing. With this developer

there need be no fear of fog. Any quality or kind of negative can be obtained by the mere change of proportions.

When intensification becomes necessary, excellent results can be obtained by the use of the usual solution of mercuric chloride, followed as a reducer by the dilute stock solution No. 11; this gives a brilliant printing negative, without danger of clogging up the finer lines, which is so often the case where ammonia is used.

There are, however, cases where it is advisable in the general routine of business to use other developers, such as eikonogen, hydrochinone, metol, rodinal and others, not that they give results which are not to be obtained by pyro, but because they act speedily, are more cleanly, and give the exact quality of negative wanted. Thus for certain fancy papers which have come into favor during the past few years, to the exclusion of albumen, eikonogen giving a thin negative full of brilliancy and detail, appeared to be the ideal developer. Upon the contrary, where harsh contrasts were wanted, such as black and white effects, hydrochinone became a favorite; the same may be said of rodinal, a proprietary compound.

Metol, one of the latest acquisitions, which it was claimed would prove a formidable competitor for pyro, has thus far, with all of its claimed advantages, failed to supplant pyro to any great extent among the profession.

The above remarks are mainly intended for the professional photographer. So far as the amateur is concerned, who practices photography for the love of the art science, or merely as a pastime, he may find some of the modern developers more to his liking than our old stand-by, pyro, as they are more easily compounded, do not discolor or stain the hands, and in some cases where they are put up in a convenient dry form, are better suited to his requirement, especially if he has no regular dark room at his disposal.

For the professional and advanced amateur or photo-scientist, who wishes to excel in his work, and produce negatives giving maximum printing qualities in brilliancy and detail, the old stand-by, pyro, with all of its disadvantages, is the only developer to use.

JULIUS F. SACHSE.

LANTERN SLIDES.

BY JOHN BARTLETT.

A LAWYER once offered to give twenty reasons to the judge for the absence of the prisoner in court. After the announcement of the first, the death of the accused, the judge kindly relieved him of the necessity of an enumeration of the other nineteen. And so when the practical slide maker is asked in what particular is gelatine inferior to wet collodion as a medium for producing transparencies intended for use in the magic lantern, he will perhaps trump up also twenty objections to gelatine, but the first suffices the inquirer, to wit: Slides with gelatine plates do not look as well as those from wet slides, when projected upon the screens.

There is apparently a falling off in the virtues of the dry plate when mustered into this special service.

Most of gelatine slides which I have examined thrown upon the screen either show a tameness in the high lights, or if vigor is secured it is at the expense of the shadows, which are flat and without gradation.

This is everything but desirable, but probably, admitting the general superiority of collodion, something in the manipulation of the gelatine plate might be held more accountable than the inherent depravity of gelatine itself. I have seen gelatine slides on which it was a delight to look, and on the screen too; but how many a gelatine slide looks perfection itself when examined out of the lantern, a marvel of softness and beauty, but on the screen flat, stale and unprofitable. Collodion slide virtues are not always patent to a mere inspection by looking through it. One learns more by experience how to judge of them.

Another objection brought against gelatine slides is the difficulty of securing uniformity of tone.

In collodion the same tone may be had, provided the conditions are the same; but we are not sure that every batch of dry plates will present the same color. Out of a dozen made with the same plates and developed with the same solution, probably only

three or four have the same tone. This is not of much consequence to the amateur, but the commercial slide maker looks on such capers askance and doubtingly.

Gelatine is so much more convenient, and then we can make slides by contact and at night. It may therefore be acceptable to the amateur to have the experience of one who has worked to try and get what is called a wet plate effect.

The best results which approach collodion work are produced by making the slide rather thin and then intensifying it.

I at first used bi-chloride of mercury and cyanide of silver, but resigned it for the following method, which you will recognize as the intensifier which Mr. Cassebaum and I employed to strengthen negatives and which was published in the AMERICAN JOURNAL OF PHOTOGRAPHY. By its use you can strengthen the slide before fixing as well as after, but I prefer to intensify after fixing ; it requires more practice to judge how far to carry the strengthening before than after. If you do intensify before fixing, wash out thoroughly a'l the developer.

Presuming, therefore, that you will strengthen after fixing, I proceed. First :

Wash out very completely all hypo from the film, then place the slide in a bath composed of

Perchloride of iron, - - -	4 grs.
Chrome alum, - - - -	2 grs.
Citric acid, - - - -	4 grs.
Water, - - - - -	1 oz.

This solution not only clears up the slide wonderfully by taking off every trace of fog from development, but also removes the last grip of hypo. It also gives a good color.

The dish containing the solution should be rocked to prevent the formation of a net-work on the film, which will show itself if you neglect this precaution.

Do not let it be in the iron solution for more than a couple of minutes, until a slight bleaching is perceptible.

After removal wash well under the tap, and then flow it over with the following solution. Do not lay it in the dish, but flow the solution over it, pouring the solution back into the graduate

to flow over again, as in wet plate practice; otherwise, one will be apt to stain the plate and also get a dense deposit of silver on the back.

A.

Gallic acid (best quality),	80 grs.
Alcohol (95°),	1 oz.

B.

Nitrate of silver,	40 grs.
Water (distilled),	1 oz.

Take one drachm each of A and B, and three ounces distilled water.

When the plate has built up to your satisfaction wash it thoroughly and dry it.

Lantern slides so made are quite brilliant, and so look very much like wet plates.

The fine quality is obtained by the gradual and slow action, giving such a fine deposit of silver as cannot be equalled by mercury.

Care should be taken in the manipulation not to touch the film with the fingers. I say this because developers of gelatine plates are apt to rub their fingers over the surface to brush off any impurities.

I would even recommend this method to commercial slide makers, but they doubtless would tell me, "Collodion is cheaper."

I also employed Mr. Cassebaum's mixture of hydrochinone as a slide intensifier.

STOCK SOLUTION.

Hydrochinone,	60 grs.
Nitric acid,	2 drops.
Water,	6 oz.

One-half ounce of this stock solution to two ounces of water, and one drachm silver solution (forty grains to one ounce water.)

The slide should be first bathed for a few minutes in acid and water (twenty grains citric acid to four ounces water).

The tones are a rich black and the high-lights clear, but I prefer the tone of the galli-silver.

Window transparencies made with it are particularly fine.

Perhaps this last method will recommend itself to beginners, as it does not require so much care as the former, but this acknowledgment does not imply that you are not to exercise all due care and cleanliness. This reminds me to give a word or two of advice in the development of gelatine lantern slides before intensification.

Did you ever look at a Levy lantern slide and delight yourself with its beauty? There is albumen in the plate, and thanks to Mr. Carbutt for his excellent gelatine albumen slow plates—use them by all means—the Levy slide is made by the so-called Taupenot process, and the development is very slow with an alkalai pyro, all detail showing first, after an acid pyro developer is applied which builds up or intensifies the image somewhat like the gallo-silver intensifier. The grain in both is very fine. Use slow plates, give full time, and develop with solution much weaker than you would employ in negative development, and gradually build up with the gallo-silver intensifier.

On looking over a large collection of lantern slides, I became interested in examining their keeping qualities. A great many of the gelatine slides showed deterioration. Some had indeed fallen in the "sere and yellow leaf," due no doubt to defective fixing or insufficient washing, and might have happened to collodion slides if hypo were as hard to eliminate from it as from gelatine. Some, both gelatine and collodion, were jaundiced by mercury. I remembered some of the *collodion slides* toned with mercury, which at the time of their genesis delighted me with the beauty of their tone. Now how abject, how fallen!

The collodion slides toned with bi-chloride of palladium were still brilliant. This is perhaps the most delightful toner of wet slides. If you use it employ it in a very dilute solution and let the toning proceed very slowly.

Among the most durable were wet slides toned with a weak hot solution of sulphide of potassium. The tones are a bluish-black, too cold for most tastes, mine included.

The slides made according to the method here given, despite the predictions of practical photographers, showed not the slightest

change; they are about eight years old. Strange to say, some experimental gelatine slides retained their pristine qualities, although they had been toned with bi-chloride of mercury before fixing. I attribute this to the bath of chloride of ammonia to which they were subjected after the mercury and a good washing after fixing, the ammonium taking up from the film the unappropriated mercury. This might suggest the bathing in chloride of ammonium of a mercury-intensified negatives before fixing, if you must use mercury.

Slides in the collection, not toned at all, were amongst the most brilliant, perhaps on account of the greater thickness of the film. They were varnished; perhaps that contributed something to their permanency.

Do not make a parade of being acquainted with distinguished or wealthy people, or having been to college, or of having visited foreign lands. All this is no evidence of any real genuine worth on your part.

Do not aspire to be a great story-teller; an inveterate teller of long stories becomes tiresome. To tell one or two witty, short, new stories, appropriate to the occasion, is about all that one person should inflict on the company.

Do not whisper in company; do not engage in private conversation; do not speak a foreign lanuage which the general company present may not comprehend, unless it is understood that the foreigner is unable to speak your own language.

Do not take upon yourself to admonish comparative strangers on religious topics; the persons to whom you speak may have decided convictions of their own in opposition to yours, and your over-zeal may seem to them an impertinence.

Do not indulge in satire; no doubt you are witty, and you could say a most cutting thing that would bring the laugh of the company upon your opponent, but you must not allow it, unless to rebuke an impertinent fellow who can be suppressed in no other way.

RECOVERING GOLD FROM OLD TONING BATHS.

A QUESTION on this subject, asked at a recent London and Provincial Photographic Association meeting, tells us that information thereon is still wanted, though the matter has been treated in these columns before with some amount of fulness; but, in view of the fact that the more modern toning baths differ materially from the old alkaline toning solutions, some little uncertainty may be felt as to how far the old methods may be available. A reference to some of the earliest editions of Hardwich's *Photographic Chemistry* will put the reader in possession of familiar modes of treatment, which are as useful now as over a quarter of a century ago. The standard method of throwing down the gold remaining from spent solutions is to add a solution of ordinary sulphate of iron. The gold is thrown down in fine powder. There is no reason whatever why the most usually adopted plan—that with sulphate of iron—should not be adopted with sulphocyanide toning baths. There is, however, this point of difference: An old sample of iron crystals that have browned by long keeping will be quite effectual; but the presence of the precipitate will be masked by the deep blood-red color that will be produced by the oxidized portion of the crystals, a very minute quantity of a ferric salt sufficing to deeply color a large body of liquid upon the addition of a sulphocyanide. With ferrous salts, such as the clean crystals of what is familiarly known as protosulphate of iron, no discoloration at all is produced.

Hence where both kinds of toning solutions are employed, the disused solutions may all be poured in one waste jar, and at a suitable time thrown down. It will, however, be better to choose nice clean crystals of the iron salt, and, if the only store at hand be browned, they may be washed in a little water before being dissolved. The chief part of the ferric salt being on the surface of the crystals, it will leave a comparatively pure salt behind, which may then be used. We may again remind the

reader that the gold takes a considerable time to deposit entirely, so that the precipitating vessel should be left for at least a day before pouring off the supernatant fluid. When strong solutions of gold are precipitated however, the metal falls down in heavier and more coherent particles; but this is an unlikely state of things under the circumstances we are considering.

The precipitate thus obtained is liable to be contaminated with organic matter, with silver, and with iron, even after being well washed, as is absolutely necessary. Hence it will be necessary to get rid of them, for the double purpose of securing pure gold for re-solution and of ascertaining the exact weight. By a series of successive washings in ammonia, water, hydrochloric acid, the gold would be fit for final washing in a small filter, which should then be dried, and the filter paper with its contained gold heated to redness in a porcelain crucible and then weighed, making a suitable allowance for the weight of the charred paper.

This residue may then be dissolved by the aid of heat in aqua regia in as small a quantity as possible. The result will be a strongly acid solution of the acid chloride of gold. It will be safe to consider that the gold used will produce double its weight of chloride of gold. It may be kept in solution of the usual strength, as the evaporating down and the reducing of this solution to the crystalline form is not really necessary, and is, moreover, a piece of work rather beyond the inexperienced photographer.

It will be quite evident, from these remarks, that the treatment of gold residues is not an extremely simple matter, like throwing down chloride of silver from the washing solutions, and the question naturally arises whether the game is worth the candle. That it is worth while to obtain all the remaining gold from spent toning baths there is no doubt; the only point is as to which of the available methods involves least trouble consistent with the avoidance of loss of the material.

In the majority of cases we very much doubt the advisability of taking this trouble, for the following reasons:

We have recently had the opportunity of examining a number of the credit notes of the metal refiners received by a well-known

photographer, who sends all his residues away. For a series of years the price given for the silver obtained ranged from 3*s.* 2*d.* to 3*s.* 5*d.* per ounce, a value which is about twenty per cent. above the market price of pure silver. Then, about twelve months or so ago, the price allowed exceeded 5*s.* per ounce. When asked for an explanation, the gentleman in question informed us that the increased price dated about the time when he took up P. O. P. and the sulphocyanide bath. All his waste baths were thrown in the waste hypo vat, and the gold went down with the silver. If we assume that the residues sent away included about equal parts of a mixture of chloride and burnt silver paper, and of hypo precipitate we see that the auric argentic precipitate from the hypo alone would be worth 10*s.* or 15*s.* an ounce.

From this and the previous considerations adduced, it is a fair inference to draw that, on the whole, the best way to treat old gold baths is to throw them all into the old hypo tub; but is such a "tub" usually to be found? We have often dealt with this subject, and we may once more have something to say upon it at no distant day.—*British Journal of Photography.*

Shadows on Background, to Avoid.—Sometimes—*e.g.*, for diagrammatic or scientific purposes—we wish to photograph some still-life object against a background, but so that it shall not show cast shadows on that background. Two courses are open to us—(1) to use a very dark background when dealing with light objects; (2) to use a light background when the object is dark. First method: Suppose the first a branched piece of white coral; arrange some flat object, a large book, drawing-board, at about 30 to 45 deg. tilt, cover it with black or dark red cloth or velvet, place the coral resting on it, and below the window, and point the camera down at it. The shadows cast on the dark background do not show. Second method: Suppose a spray of green foliage to be the object; in place of the drawing-board, support the object on a sheet of clear glass similarly placed, and at some distance behind it, but sufficiently far away that it receives no cast shadows, place a sheet of white blotting-paper.

COLOR PHOTOGRAPHY.

BY PROFESSOR GABRIEL LIPPMAN.

THE problem of color photography is as old as photography itself. The desire of fixing the colors as well as the design of the beautiful image thrown on the screen of the camera very naturally occurred to the earliest observers. Since the beginning of this century three distinct solutions of the problem have been realized.

The first solution, not quite a complete one, is founded on the peculiar properties of a silver compound, the violet sub-chloride of silver. E. Becquerel (1860) converted the surface of a daguerreotype plate into this silver compound, and by projecting on it the image of the solar spectrum, and other objects, obtained good colored impressions. Poitevin substituted paper for the silver plate as a substratum. No other surface has been discovered that can play the part of the sub-chloride of silver. Moreover, the image is not fixed, in the photographic sense of the word; that is, the colored impression is retained for any length of time in the dark, but it is blotted out by the action of daylight. The reason of it is this: the Becquerel images are formed by colored silver compounds, which remain sensible to light; so that they are destroyed by the continued action of light, in virtue of the same action which gave them birth. Despite the numerous experiments made by Becquerel, Poitevin, Zenther, and others, no substance has been found that is capable of destroying the sensibility of the sub-chloride for light without at the same time destroying its color.

The second method for color photography is an indirect one, and may be called the three-color method. It was invented in France by Ch. Cros, and at the same time by M. Ducus du Hauron (1869). German authorities claim the priority of the idea for Baron Bonstetten. Three separate negatives (colorless) are taken of an object through three colored screens. From these, three positives (equally colorless) are made; and lastly, the

*A lecture delivered before the Royal Society of London.

color is supplied to these positives by means of aniline dyes or colored inks. Thus, three colored monochromatic positives are obtained, which by superposition give a colored image of the model. In the ingenious process lately invented by Professor Joly, the three negatives, and apparently the corresponding three positives, are obtained interwoven on one and the same plate. The three-colored method can give a very good approximation to the truth, and has probably a great future before it. We may call it, nevertheless, an indirect method, since the colors are not generated by the action of the light, but are later supplied by the application of aniline dyes or other pigments. Moreover, the choice of these pigments, as well as of the colored screens through which the negatives have been obtained, is in some degree an arbitrary choice.

The third and latest method by which color photography has been realized is the interferential method, which I published in 1891. It gives fixed images, the colors of which are due to the direct action of the luminous rays.

For obtaining colored photographs by this method, only two conditions are to be fulfilled. We want (1) a transparent grainless photographic film of any kind, capable of giving a colorless fixed image by the usual means; and (2) we want a metallic mirror, placed in immediate contact with the film during the time of exposure.

A mirror is easily formed by means of mercury. The photographic plate being first enclosed in a camera-slide, a quantity of mercury is allowed to flow in behind the plate from a small reservoir, which is connected with the slide by a piece of india-rubber tubing.* The slide is then adapted to the camera, and the action of light allowed to take place. After exposure the slide is separated from the camera, the mercury reservoir lowered so as to allow the mercury to flow back into it; the photographic plate is then taken out, developed and fixed. When dry, and examined by reflected light, it appears brilliantly colored.

The sensitive film may be made either of chloride, iodide, or

* The glass side of the Photographic plate has been turned towards the objective, so as to bring the film in contact wtjh the metallic mirror.

bromide of silver, contained in a substratum either of albumen, collodion, or gelatine. The corresponding developers, either acid or alkaline, have to be applied; the fixation may be cyanide or bromide of potassium. All these processes I have tried with success. For instance, the photograph of the electric spectrum now projected before your eyes, has been made on a layer on gelatino-bromide of silver, developed with amidol, and fixed with cyanide of potassium.

As you see, bright colored photographs may be obtained without changing the technique of ordinary photography; the same films, developers and fixators have to be employed; even the secondary operations of intensification and of isochromatization are made use of with full success. The presence of the mirror behind the film during exposure makes the whole difference. From a chemical point of view nothing is changed, the result being a deposit of reduced silver left in the film, a brownish, colorless deposit. And yet the presence of a mirror during exposure causes the colorless deposit to show bright colors. Of course we want to know how this is done; we require to understand the theory of those colors.

We all know that colorless soap-water gives brilliant soap-bubbles; the iridescence of mother-of-pearl takes place in colorless carbonate of lime; the gorgeous hues of tropical birds are simply reflected from the brownish substance which forms the feathers. Newton discovered the theory of these phenomena, and subjected them to measurement; he invented for the purpose, the experiment called by the name of Newton's rings. Newton showed, as all know, that when two parallel reflecting surfaces are separated by a very short interval, and illumined by white light, they reflect only one of the colored rays which are the constituents of white light. If, for instance, the interval between the reflecting surface is only $\frac{3}{10000}$ of a millimetre, violet rays are alone reflected, the rest being destroyed by interference; that is, the two surfaces send back two reflected rays whose vibrations interfere with one another, so as to destroy every vibration except that which constitutes violet light. If the interval between the reflecting surfaces be augmented to $\frac{5}{10000}$ of a millimetre, the

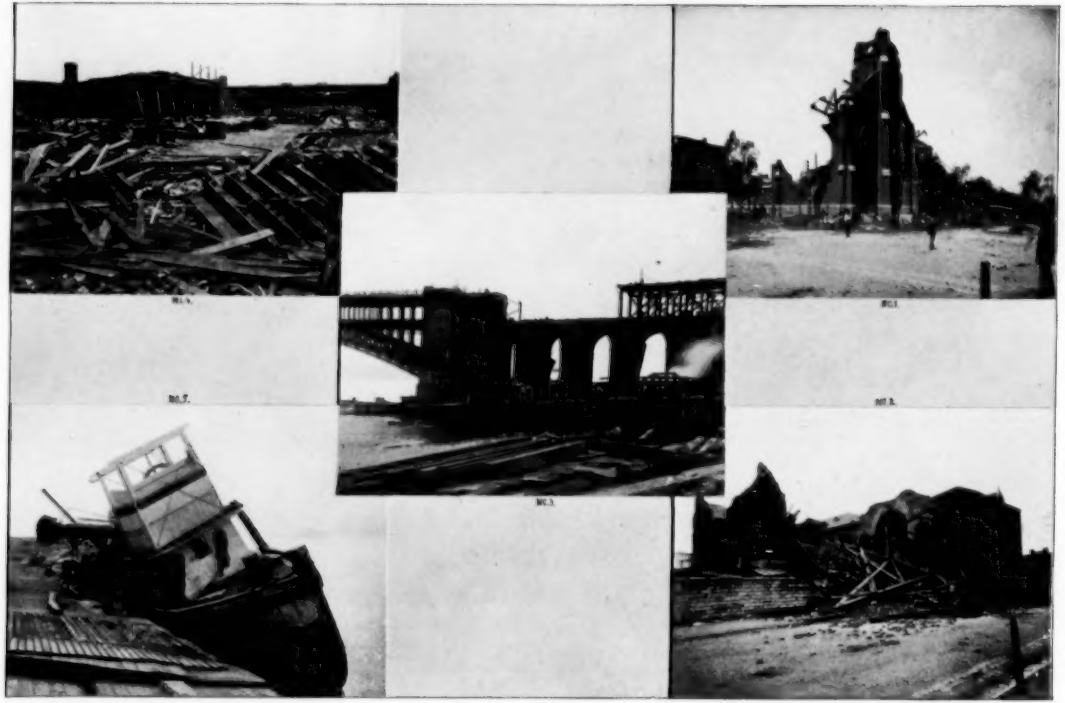
destruction of vibration takes place for every vibration except that of red light, which alone remains visible in this case.

If we consider now this photograph of the spectrum, and especially the violet end of the image, we find that this is formed by a deposit of brown reduced silver. In the case of an ordinary photograph, this deposit would simply be a formless cloud of metallic particles; here the cloud has a definite, stratified form; it is divided into a number of thin equidistant strata, parallel to the surface of the plate, and $\frac{2}{10000}$ of a millimetre apart. These act as the reflecting surfaces considered by Newton, and as they are at the proper distances for reflecting violet rays, and these alone, they do reflect violet rays.

The red extremity of the photograph is equally built up of strata which act in a like manner; but only their distance intervals here amount to $\frac{3}{10000}$ of a millimetre, and that is the proper interval for reflecting red light. The intermediate parts of the spectral image are built up with intermediate values of the interval, and reflect the intermediate parts of the spectrum.

The appearance of color is therefore due to the regular structure above described, imprinted on the photographic deposit. The next question is—How has this very fine, peculiar, and adequate structure been produced?

It is well known that a ray of light may be considered as a regular train of waves propagated through the ether, in the same way as waves on the surface of water. The distance between two following waves is constant, and termed the wave-length; each sort of radiation, each color of the spectrum, being characterized by a particular value of the wave-length. Now, when a ray of light falls on a sensitive film, this train of waves simply rushes through the film with a velocity of about 300,000 kilometres per second; it impresses the film more or less strongly, but leaves no record of its wave-length, of its particular nature of color, every trace of its passage being swept out of form by reason of its swift displacement. The impression therefore remains both uniform and colorless. Things change, however, as soon as we pour in mercury behind the plates, or otherwise provide for a mirror being in contact with it. The presence of the *mirror*



ST. LOUIS' TORNADO SCENES.

FROM PHOTOGRAPHS BY J. C. STRAUSS OF ST. LOUIS.

ST. LOUIS COMP. COTTON CO.

THE S. C. CLUB AT EAST ST. LOUIS.

EADS BRIDGE AND FERRY BOAT WRECK, EAST ST. LOUIS.

ST. NEPOMUK CHURCH.

ST. FRANCIS' CHURCH.

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changes the propagated waves into *standing* waves. The reflected ray is, namely, thrown back on the incident ray, and interferes with its motion, both rays having equal and opposite velocities of propagation. The result is a set of standing waves—that is, of waves surging up and down each in a fixed plane. Each wave impresses the sensitive film where it stands, thus producing one of these photographic strata above alluded to. The impression is latent, but comes out by photographic development. Of course the distance between two successive strata is the distance between two neighboring waves; this, theory shows, is exactly half the wave-length of the impressing light. In the case of violet, for instance, the wave-length being $\frac{4}{10000}$ millimetres, half the wave-length is the above quoted distance of $\frac{2}{10000}$ millimetres; this, therefore, is at the same time the interval between two standing waves, in the case of violet light, the interval between two successive photographic strata, and at last it is the interval required to exist, according to Newton's theory, for the said strata reflecting violet rays, and making these alone apparent when illumined by white light.

The colors reflected by the film have the same nature and origin as those reflected by soap-bubbles or Newton's rings; they owe their intensity to the great number of reflecting strata. Suppose, for instance, the photographic film to have the thickness of a sheet of paper (one-tenth of a millimetre), the fabric built in it by and for a violet ray is five hundred stories high, the total height making up one-tenth of a millimetre. Lord Rayleigh, in 1887, has proved *a priori* that such a system is specially adapted to reflect the corresponding waves of light.

How are we now to prove that the above theory is really applicable to the color photograph you have seen? How can we demonstrate that those bright colors are due not to pigments, but to the interference, as in the case of soap-bubbles? We have several ways of proving it.

First of all, we are not bound to the use of a peculiar chemical substance, such as Becquerel's sub-chloride of silver; we obtain colors with a variety of chemicals. We can, for instance, dispense entirely with the use of silver salt; a film of gelatine or coagu-

lated albumen impregnated with bichromate of potash, then washed with pure water after exposure, gives a very brilliant image of the spectrum.

Secondly, the colors on the plate are visible only in the direction of specular reflection. The position of the source by which we illumine the photograph being given, we have to put the eye in a corresponding position, so as to catch the regularly reflected rays. In every other position we see nothing but a colorless negative. Now, as you are aware, the colors of pigments are seen in any direction. By projecting again a photograph of the spectrum, and turning it to and fro, I can show you that the colors are visible only in one direction.

Thirdly, if we change the incidence of the illuminating rays, that is, if we look at the plate first in a normal direction, then more and more slantingly, we find that the colors change with the incidence exactly as they do in the case of soap-bubbles, or of Newton's rings; they change according to the same law, and for the same reasons. The red end of the spectrum turns successively to orange, yellow, green, blue and violet. The whole system of colors, the image of the spectrum, is seen to move down into the part impressed by the infra-red. This is what we expect to happen with interference colors, and what again we cannot obtain with pigments.

Fourthly, if while looking at the film normally, we suffer it to absorb moisture—this can be done by breathing repeatedly on its surface—we see that the colors again change, but in an order opposite to that above described. Here the blue end of the spectrum is seen to turn gradually green, yellow, orange, red, and finally infra-red, that is, invisible. The spectrum this time seems to move up into the ultra-violet part of the improved film. By suffering the water to evaporate, the whole image moves back into its proper place; this experiment may be repeated any number of times.

The same phenomenon may be obtained with Newton's apparatus, by slowly lifting the lens out of contact with the plane surface. The explanation is the same in both cases. The gelatine swells up when imbibing moisture. If we consider, for in-

stance, the violet of the spectrum, the small intervals between the strata, corresponding to violet rays, gradually swell up to the values proper for green, and for red, and for infra-red; green, then red, then infra-red, are therefore successively reflected.

We will wet this photograph of the spectrum with water, project it on the screen, and watch the colors coming back in the order prescribed by theory.

It is necessary to use a transparent film, since an opaque one, such as is commonly in use, would hide the mirror from view; the sensitive substance must be grainless, or, at least, the grains must be much finer than the dimensions of the strata they are intended to form, and therefore wholly invisible. The preparation of transparent layers gave me at first much trouble; I despaired for years to find a proper method for making them. The method, however, is simply thus: if the sensitive substance (the silver bromide, for instance) be formed in presence of a sufficient quantity of organic matter, such as albumen, gelatine, or collodion, it does not appear as a precipitate; it remains invisible; it *is* formed, but seems to remain dissolved in the organic substratum. If, for instance, we prepare a film of albumeno-iodide in the usual way, only taking care to lessen the proportions of iodide to half per cent. of the albumen, we get a perfectly transparent plate, adapted to color photography.

We want now to go a step further. It is very well for physicists to be contented with working on the spectrum, since that contains the elements of every compound color; but we all desire to be able to photograph other objects than the spectrum—common objects with the most compound colors. We have again but to take theory as a guide, and that tells us that the same process is able to give us either simple or compound colors. We have then to take a transparent and correctly isochromatized film, expose it with its mercury backing, then develop and fix it in the usual way; the plate, after drying, gives a correct colored image of the objects placed before the camera. Only one exposure, only one operation is necessary for getting an image with every color complete.

A plausible objection was offered at first to the possibility of

photographing a mixture of simple colors. The objection was this: a ray of violet gives rise to a set of strata separated by a given interval; red light produces another set of strata with another interval; if both co-exist, the strata formed by the red are sure to block out here and there the intervals left between the strata formed by the violet. Is it not to be feared that one fabric will be blurred out by the other, and the whole effect marred? The confusion would be still worse if we consider the action of white light, which contains an infinity of simple components; every interval here is sure to be blocked up.

Mathematical analysis, however, shows this objection to be unfounded; we have great complexity but not confusion. Every compound ray, both colored and white, is faithfully rendered. As an experimental proof of this, we will project on the screen photographs of very different objects, namely, stained-glass windows, landscapes from nature, a portrait made from life, and vases and flowers.

That the colors here observed are due to interference, and not to the presence of pigments, can be shown in the same way as with the spectrum. Here, again, we observe that the colors are visible only in the direction of specular reflection, that they change with the angle of incidence, that they change and disappear by wetting, and re-appear by drying. Pigments remain equally visible and unaltered in color under every incidence. If we attempted to touch up one of our photographs with oil or water-colors, the adulterated place would stand out on a colorless background by merely obscuring by diffused light. It is therefore impossible either to imitate or touch up a color photograph made by the above described interferential method.

A Love of Justice.—"Where did you get that cake, Annie?"

"Mamma gave it to me."

"She's always a-giving you more'n she does me."

"Never mind, Harry; she's going to put mustard plasters on us to-night, and I'll ask her to let you have the biggest."

PLAIN HINTS FOR JUDGING PAPER.

SIZING.—The every-day tests as to hardness of sizing answer every ordinary purpose: Moisten with the tongue, and if the paper is slack-sized you can detect it often by the instant drawing or absorption of the moisture. Watch the spot moistened, and the longer it remains wet the better the paper is sized. Look through the spot dampened—the poorer the sizing the more transparent is the paper where it is wet. If thoroughly sized no difference will be apparent between the spot dampened and the balance of the sheet. When there is a question as to whether a paper is tub or engine sized, it can be usually decided by wetting the forefinger and thumb and pressing the sheet between them. If tub-sized, the glue which is applied to the surface will perceptibly cling to the fingers.

To test the ink-resisting quality of paper draw a heavy ink line across the sheet. If the paper is poorly sized, a feathery edge will appear, caused by spreading of the ink. Slack-sized paper will be penetrated by the ink, which will plainly appear on the reverse side of the sheet.

SURFACE DIRT.—Only dirt showing on the surface of a sheet should be considered a serious detriment. To judge the comparative cleanliness of several sheets of paper, draw a small circle around the larger specks to facilitate comparison.

TO DETERMINE THE DIRECTION OF THE GRAIN.—An easy but sure test to determine the direction of the grain in a sheet of paper, which will be found useful and worth remembering, is as follows:

For instance, the size of sheet is 17x22 inches. Cut out a circular piece as nearly round as the eye can judge; before entirely detaching from the sheet, mark on the circle the 17-inch way and the 22-inch way; then float the cut-out piece on water for a few seconds; then place on the palm of the hand, taking care not to let the edges stick to the hand, and the paper will curl until it forms a cone; the grain of the paper runs the opposite way from which the paper curls.

ABSORBING POWERS OF BLOTTING PAPER.—Comparative tests as to absorbing powers of blotting can be made between sheets of same weight per ream by allowing the pointed corner of a sheet to touch the surface of a drop of ink. Repeat with each sheet to be tested, and compare the height in each to which the ink has been absorbed. A well-made blotting paper should have little or no free fibre dust to fill with ink and smear the paper.

TEST FOR GROUND WOOD.—Make a streak across the paper with a solution of an aniline sulphate or with concentrated nitric acid; the first will turn ground wood yellow, the second will turn it brown. We give aniline sulphate the preference, as nitric acid acts upon unbleached sulphite, if present in the paper, the same as it acts upon ground wood, viz., turning it brown.

HOW ARTIFICIAL ICE IS MADE.

FEW people understand how artificial ice is manufactured In New York City there are some very important ice-producing plants. The largest of them occupies nine city lots. In the freezing-house there are three tanks on each floor, having each a capacity for producing two hundred tons every day. Connected with these freezing-rooms are two cold-storage warehouses, in which about four hundred tons of ice are usually kept in reserve for quick uses in case of an emergency. The first floor of the engine-house is occupied by three large De La Vergne engines. On the second floor there are the coolers and filters, on the third floor the water-condensers, and on the fourth the ammonia-condensers. The boiler-house contains three boilers, each of nearly four hundred horse-power. It may be surprising to know that the loading arrangements are so perfect that a wagon can be fully laden in two minutes. In the actual manufacture the cold water is first heated to a temperature of 340 degrees Fahrenheit, so that all bacteria may be destroyed. For this purpose, of course, the boilers are used, and from them the steam goes through the pipes to the steam filters, and thence to the

condensers, where it is condensed to water again. Then it is reboiled, cooled, and goes through the deodorizers. The purified water now flows through large pipes to the freezing rooms. It enters galvanized iron cans, each having a capacity of a little over five cubic feet of water. The cans are now lowered into the freezing tanks. These have been filled with strong brine, through which run coils of pipe filled with ammonia. This ammonia expands as it flows and absorbs the heat from the brine. The temperature is thus reduced to 15 degrees Fahrenheit. The cans remain in the brine for two days and a half. Those of us who are familiar with artificial ice as it is carried about the streets have often remarked the white core running through the centre of each cake. This core is the result of the fact that there is always some air in the water, and this is forced to the centre during the process of freezing. Artificial ice is denser and colder than natural ice. The first gives more permanence, and the second more immediate refrigeration. The present natural ice crop of the United States is about twenty-two million tons.

PLATINOTYPE PRINTING.

THE patent rights in respect to making platinotype paper having expired, Mr. T. Mitchell at a recent meeting of the Darwen Photographic Society gave the formulæ for its preparation for the benefit of those who desired to prepare their own.

No. 1.

Ferric oxalate - - - -	600 grs.
Distilled water - - - -	5 ozs.
Oxalic acid - - - -	40 grs.

No. 2.

Chloro-platinite potassium - -	400 grs.
Distilled water - - - -	5 ozs.

Take of No. 1 solution - - - -	22 drs.
No. 2 solution - - - -	24 drs.
Water - - - - - -	4 drs.

The paper after being sized according to the tint required (*i. e.*,

gelatine for bluish black, and starch or arrowroot for brownish), is floated face downward in the above solution for not more than three minutes, then dried in about 100 degrees Fahr., care being taken not to exceed this temperature, otherwise fogged prints will be the result.

He placed frames about six inches from the flame of the Platinotype Company's lamp until the magnesium was burnt away, after which he showed the method of development, using the salts as sold by the Company on account of them producing better half-tones, urging the importance of having the developer at a maximum temperature of 60, and a maximum of 100 degrees Fahr. On account of the vigorous action of the developer, attention was drawn to the manner of development, which was better done by taking hold of the paper at each end and drawing it face downwards through the solution once. This was to prevent the adhesion of air bubbles on the picture, and to be more certain of damping the whole surface without leaving dry patches, as the action of the developer is so rapid that by the time the defects were noticeable it is very often too late to rectify. In addition to this it allows a little more time to examine, and with three immersions the picture is generally about developed. After this the prints are transferred to three baths of hydrochloric acid and water 1 to 60, and allowed to remain five, ten and ten minutes respectively, then washed for about twenty minutes in running water. The whole operation of printing, clearing and washing is completed in much under an hour.

The use of *pure* hydrochloric acid during the clearing process was strongly advocated, and the rejection of the third bath immediately it assumed the least trace of yellowness, this being essential if permanent prints are to be the result. By making the following solution slightly alkaline, warm tones might be produced. Potash, soda, or the carbonate of these alkalies may be used, but on no account in larger quantities than just sufficient to turn red litmus paper black (ammonia is unsuitable).

Oxalate of potash solution, normal strength, *i. e.*, 1 lb. of oxalate dissolved in 54 ozs. of water,	1 part.
Water, - - - - - - - -	2 parts.

PHOTOGRAPHY IN NATURAL COLORS.*

(Continued from page 663.)

THE point to be observed is that a red color is the first to be produced under the influence of red rays, and if Schultz-Sellack's hypothesis were correct it would follow in the first place that the red rays have the greatest mechanical effect, and that red is the first "sub-division color" to be formed. Then, as a necessary consequence, all the other colors ought to appear one after the other in place of the red by prolonged exposure to the red ray, and, moreover, all the other rays ought to produce a red color as the first result of their action. The actual facts are very different. Green, blue and yellow, and not red, are respectively the first products of the action of green, blue and yellow rays, and prolonged exposure of the red product to the action of the red rays simply increases its intensity, and does not convert it into other colors.

Similar results are obtained with the Seebeck and Poitevin processes. Before the color which first appears has undergone any change by prolonged exposure, the other colors make their appearance in their own places.

Further, Wiener points out that the whole behavior of the colors reproduced by the three old processes referred to is opposed to the Schultz-Sellack hypothesis. They are seen under illumination from all sides. When observed by reflected light the colors do not apppreciably alter with a change in the angle of incidenee, whereas the sub-division colors would alter as the angle of incidence varied.

The conclusion to be deduced from all this evidence is clearly that the Schultz-Sellack hypothesis that the colors are due to different degrees of sub-division of the particles, resulting from different quantities of light action, independently of the color of the rays, does not hold good in the case of the old processes of Seebeck, Becquerel and Poitevin.

It does not, however, follow that the quantity of light action,

* C. H. B., in *Photography*.

as determined by the intensity of the illumination and the duration of exposure, is without any influence at all on the colors produced. On the contrary, it is well known that the exposure is an important factor in the character of the results obtained by Lippmann's process. At the same time the phenomena are different, and are due to causes different from those involved in Schultz-Sellack's hypothesis, which is untenable, not because there is no relation whatever between the exposure and the color produced, but because such relation as there may be is not at all of the kind that Schultz-Sellack supposed.

METHOD OF DISTINGUISHING BETWEEN INTERFERENCE COLORS AND PIGMENT COLORS.

It is obvious that the primaray desideratum is some method of observation or experiment that shall afford a crucial test between interference colors and pigment colors. Wiener, with considerable ingenuity, has devised a very simple method, which involves the use of nothing more than a right-angled prism with three polished faces, and a refractive liquid for expelling the film of air from between the face of the prism and the paper or film on which it is laid. The prism should, if possible, be made of glass having an index of refraction of about 1.75 for the sodium line D, but a less highly refractive glass can be used with definite results.

The prism is laid on the colored image in such a way that the hypotenuse face is in contact with the paper or film, the right angle being uppermost, whilst the edge between the hypotenuse face and one of the other faces cuts the spectrum photograph into two parts along its length, the edge being parallel with the edges of the spectrum. Under these conditions half the colored photograph is seen as usual through the air only, while the other half is seen through the prism. In order to provide a point of reference and prevent errors of observation, a line is drawn across the yellow of the colored spectrum at right angles to its length, or, in other words, parallel with the Fraunhofer lines, or bright lines, as the case may be

The removal of the film of air between the photograph and the

face of the film is effected by pouring benzine between them. If this were not done, the air would cause secondary refractions, which would interfere with the result.

In making an observation, the observer looks through that face of the prism which is the furthest away from the colored image, the position of the eye being such that a line from it to the face of the prism is normal to the latter, and its distance being such that the observer can see that part of the colored image which is not under the prism, as well as that which is. Moreover, the position of the eye must be such that the reference line previously described is seen as a continuous straight line, and does not appear to be broken at the point where it passes under the prism.

Now, if the colors of the photograph are interference colors, the various refractions which the light undergoes under the conditions specified alter the directions between the paths of the waves reflected from two successive elementary mirrors, and the result is that the colors of that part of the photograph which is seen through the prism are changed. The change can be calculated if the refractive indices of the materials of the prism and of the film respectively are known.

When this mode of observation is applied to a Lippmann spectrum, that part which appears yellow by direct light appears blue-green and green under the prism, even when the glass of the prism has a refractive index of only 1.52, and the alteration is, of course, greater when the glass has a higher refractive power. The phenomena with Becquerel's plates will be described subsequently.

It is, of course, well known that with interference colors there is a shifting of the colors by a mere change in the angle of incidence under which they are observed, but the prism method is very much more sensitive. It may be observed here that with one and the same prism the extent to which the colors are displaced varies a little with different films of the same kind, a result which is due to variations in the refractive index of the films, which in its turn depends on the relative proportion of silver chloride and silver sub-chloride in the sensitive material.

The observations seem to indicate that the refractive index of silver sub-chloride is very much higher than that of ordinary silver chloride (2.0), but it is not probable that the refractive index of the film, as a whole, in the case of Becquerel plates, is as high as 3.0, because it must always consist in the main of silver chloride. The prism method is applicable with a refractive index up to 5.0, and the refractive index of molecular silver is about 4.0 according to Wernicke and Drude, but it is probably not really so high, and hence the prism method is applicable to all cases that are likely to arise, at any rate, with silver compounds.

A very interesting application of the prism method would be, Wiener suggests, to employ it to test Wernicke's supposition that the different colors of Carey Lea's so-called allotropic modifications of metallic silver are really only interference colors of molecular silver. If this were correct the golden yellow color would become yellow-green under the prism. If observation shows that no change takes places, it will be safe to conclud that the colors are pigment colors, and consequently that the various products described by Carey Lea are truly different modifications of silver.

(To be continued.)

A Paper of Tacks.—When in doubt tell the truth.

Clerk and shirk may rhyme, but they don't sound well together.

The young man who knows only a part of it learns more than he who knows it all.

Try and think as much about business when out of the store as you do of your pleasure when in the store.

There was a cigarette-smoking clerk who once became proprietor, but it was by accident.

If you spend every cent you earn, you won't wear out shoe leather in going to the savings bank.

If you must smoke while at business, do it under the nose of the "boss," and not in the basement. You will the sooner learn what he thinks of you.

Constant abuse of those under you will strengthen your lungs at the expense of your manners.

THE CONVENTION.

THE sixteenth annual convention of the Photographers' Association of America is now a thing of the past. As is known to all our readers, the convention was held at Celeron on Chautauqua Lake, on June 22–27. A synopsis of the proceedings shows that business and pleasure went hand in hand.

The proceedings were opened on Monday evening, June 22, with an informal reception at Convention Hall, followed by an enjoyable promenade concert by the band.

On Tuesday morning, at 10 o'clock, the formal opening of the convention took place. The ceremonies consisted of an address of welcome by Hon. Porter Sheldon, then followed the President's address, reports, and appointment of committees.

At 2 p.m. a school of photography was opened.

The day was closed in the evening with a lawn fete at Greenhurst and collation tendered the visiting photographers by the dealers in photo-materials.

The third day was devoted to routine business, and a committee report on "Progress of Photography," by A. L. Bowersox, and addresses by J. Ed. Rosch, of St. Louis, M. R. Hemperley, of Philadelphia, on generalities, M. J. Steffens, of Chicago, and C. M. Hayes. The proceedings closed with a discussion by members on the subject, "Is the Single Steep Light the Best?"

The rest of the day was devoted to social diversion, a game of base ball at 3 p.m., Demonstrators vs. Photographers, and at 8 p.m. a grand ball at the Kent House, Lakewood, given by the gay and festive Demonstrators.

Thursday was ushered in by reports of committees and an appointment of one on nominations. Addresses by the following gentlemen took up the remaining time of the morning session, viz.:

Address—Ben Larrimer, President of Indiana State Association.

Address—A. M. Cunningham, "The Background and Its Effect on the Photograph."

Address—F. Dundas Todd, "Progress in Photography."

Address—John S. Schneider, "Art Photography."

Address—E. B. Core, "Children."

Address—Geo. B. Sperry.

In the afternoon, athletic sports, foot races, bicycle races, swimming and boat races, were the order of the day, which was ended by a "grand moonlight excursion," with collation, music and dancing. This was given by the manufacturers of photo-materials.

On Friday the reports of committees and the election of officers was disposed of, after which excellent addresses were delivered by G. G. Rockwood, of New York; W. M. Hollinger, of Dayton, O.; S. L. Stein, Milwaukee-Chicago.

In the afternoon there was another concert by the band in Convention Hall, and a grand display of pyrotechnics tendered by the American Aristotype Company.

Saturday, the closing day of the convention, was devoted to the reports of the judges, an announcement of awards, and the presentation of medals.

It is a gratifying fact that at least two of the most important gold medals were secured by Philadelphians, viz.: M. R. Hemperley, of the Hemperley studio, 820 Arch Street, Philadelphia, president of the Photographers' State Association of Pennsylvania, for portraits in Class B.; the other recipient being South Brothers, for landscape photography, both awards being the highest in their class.

The award to Mr. Hemperley was for a group of six exquisite portraits, which, for technique, posing and lighting, were far above any specimens of his competitors, among whom were the leading portraitists in the United States and Canada. We are enabled to reproduce one of these charming portraits; the mechanical reproduction, however, fails to show the beauties of the original.

The photographs exhibited by Messrs. South Brothers were a surprise to many of their competitors, as they are comparatively new attendants at the convention.

As to the convention itself, the present one was by far the most successful one thus far held in the history of the association.

Never was there so large an attendance or number of exhibits. Then again, Celeron, on Lake Chautauqua, is the ideal place for a gathering of this kind. The exhibition hall was voted simply delightful, with the exception as to the means of lighting the pictures, a defect which is to be altered in the near future.

One of the most gratifying features of the exhibition was the noticeable improvement in the practice of the photographic art over preceding exhibitions, a fact which, of course, must be traced to the influence of the convention.

Men who only a year or two ago occupied almost unknown positions in the profession, to-day, thanks to the influence of the various conventions, rank well abreast of the leaders, and in some cases have even distanced the old-time favorites, as is shown in the case of the South Brothers. Philadelphia always was a leading photographic centre of this country, and judging from the present instance is likely to remain so for some time to come.

Rays on the Trunks.—The lazy inventor at the unclaimed baggage sale.—Meekin, the lazy inventor, wandered into the *Electrical Review* office the other day with his pockets bulging out and several bundles in his hand.

"I'm all ready to bid," he remarked.

"Bid on what?"

"Why don't you know?"

"No."

"Well, you see the express companies every now and then have an auction sale of unclaimed packages. There's one to-day and I'm going to attend it."

"What of it?"

"Why, hang it, don't you understand? I've got my portable X ray outfit along with me, and as the auctioneer puts up each package I'll get a snap shot radiograph of its contents I've hired three or four men to delay the bidding by raising the price five cents at a time. This will give me an opportunity to develope my negatives, and when I find one that shows a package containing something of value I'll bid her in. To be sure there's a little uncertainty about the scheme, but then, you know, they sometimes ship diamonds by express.

The Editorial Dropshutter.

The Portrait "Artist" Abroad.—A bogus tea agent has been fleecing housewives in Clarksboro, N. J., for some time past by the portrait scheme. The method of the agent is to secure the orders of the unsuspecting woman for a new tea which he is offering at a very low price, and the purchaser is assured that a portrait of one of the world's celebrities will accompany the orders. The purchasers are waiting for the portraits.

Tesla's New Light.—How soon Nicola Tesla will consent to make public his new light, and give its principles to the world, he will not say. He declared the other day that when it had reached the perfection which he believes it is capable of he will present his discovery before an electrical or other scientific society, and demonstrate that not only is it the realization of a principle which he enunciated in St. Louis eight or ten years ago, and so set electricians experimenting along those lines, but that the light may be manufactured cheaper than any form of electric lighting known. Without filaments and without their attendant perishable quality, with nothing save a vacuum and an enormous vibrating power of electricity, light will be made as nature makes it, by the vibration of the molecules.

They Got No Pictures.—J. G. Wells, alias Richard Finney, alias Richardson, of South Seventh Street, a photograph canvasser, was arrested in Philadelphia at the instance of Detective Crawford, on the charge of obtaining money by false pretence. Numerous complaints had been made to the police authorities that a gang of men, including the defendant, had been going around soliciting orders for photographic work, using the names of G. Yeager, Chandler & Sheetz, Gilbert & Bacon, and other well-known photographers. Finney's method, it is said, was to collect 50 cents to $1.50, and give a receipt and an order on the photographer whom he pretended to represent, for the time being, at the same time handing the customer an order which stated that the photographer would call at the house and take the picture. The photographers whose names were thus fraudulently used had suffered considerable annoyance from visits of persons who claimed to have paid their money and who were importunate in demanding the fulfillment of the contracts. The business of one or two firms is said to have been severely damaged by the fraudulent operations of Finney

"TELLING THE DAISIES."

and his confederates. Finney, on being arrested, denied his identity, but the police, on searching his house, found the names of fifty persons who had paid money and given orders for work, it is alleged, and books containing blank order slips. At a hearing before Magistrate Jermon at the City Hall, Etta Walker, of 1373 South Forty-sixth Street, testified that on January 1st last she had paid $1.50 to the defendant, who pretended to be an agent for Chandler & Sheetz, and that the work contracted for had not been done. George Yeager, 16 South Thirteenth Street, said he had employed Finney, alias Richardson, about two years ago and had suffered thereby. Samuel Sheetz, 1433 Chestnut Street, of the former firm of Chandler & Sheetz, testified to the annoyance arising from complaints by persons who had paid money to Finney for the alleged account of the firm. Finney was committed in default of $1000 bail for a further hearing on the charges of constructive larceny and false pretence.

Reversing the Kinetoscope.—"Impossibilities made possible by means of the modern inventions in the electrical field" furnished the theme of a lecture by Professor G. Queroult, in the Paris Academy of Sciences. During some of his experiments he hit upon the idea to turn around photographic records and also the series of pictures seen through the kinetoscope, respectively the kinematograph. Having photographed a plant at regular intervals and shown in the kinetoscope the growth, the development of the stem, leaves, buds, flowers and fruit, the same consequence of photographic pictures reversed was presented to the eye of the astonished academicians, who wondered at the fruit turning into flowers, flowers into buds, buds drawing back into themselves and disappearing, the leaves closing, getting smaller and disappearing, the stem getting shorter and shorter, until the earth closed over it. The most incredible things are developed before the eyes of a spectator, if a most ordinary series of pictures is reversed. A drinker takes up an empty glass and replaces it full upon the table; a smoker sees the stump of a cigar flying at him from the floor, takes it to his mouth and sees the smoke originate in the room, draws it up his mouth and into his cigar, which is gradually lengthened and finally replaced in the pocket. A wrestler, who has probably thrown away his garments, is recovered with them by their, so to speak, walking up on him into their places, while he himself performs motions of which we can understand nothing, because we never saw these most ordinary motions performed backward; a man, for instance, seated at a table before an empty plate, works hard taking bite after bite from

his mouth, until the chicken is whole again on the dish before him, and the side dishes are also returned full to their respective places. In order to fully enjoy an exhibition of the kinetoscope, such an exhibition should be arranged alongside of each other, the same scenes in regular order in one machine and reversed in the other. It would be advisable, however, to inform the spectators previous to their looking at such a reversed series of pictures, for otherwise they might think themselves the victim of a dream, a hallucination, or something worse.

Personal.—Edward Bausch and family are in Europe for a short stay. Mr. Bausch will combine business with pleasure, and incidentally introduce the Iris diaphragm shutter and other products of the Bausch & Lomb works more thoroughly into the European markets, returning early in the summer with the expectation of spending the fall season abroad. Mr. Henry Lomb and wife are also in Europe visiting their sons, who are doing post-graduate work in Heidelberg University.

An Honorable Distinction.—The firm of C. P. Goertz, of Schöenberg, near Berlin, were granted the first premium and special diploma of honor of the photographic exhibition at Harlem, Holland.

The Pan-Russian Exhibition.—F. V. Szczepanski, of St. Petersburg, Russia, announces that the general commissariate of the Pan-Russian Industrial Exhibition in Nijni Novgorod has bestowed on him the care of the organization of the official technical reading-room, in connection with which will be the only book-selling shop for the sale of the products of the technical literature in the exhibition.

The Great Cyclone and Newspaper Enterprise.—The first vague bulletin from Chicago of the great cyclone at St. Louis had barely been confirmed as to the main facts of the destructive visitation when the New York *World's* arrangements to report the extent of the wreck and ruin pictorially with the fidelity of the camera were well under way.

By both the Western Union and the Postal Telegraph Companies a commission was sent to Strauss, the well-known photographer, to obtain views at every point of interest along the path of the tornado from the southwestern edge of St. Louis to the national stock yards in East St. Louis for *The World.* Through the special exertions of the telegraph companies these orders were delivered promptly over circuitous routes in St. Louis, which was almost cut off from communication, and

at break of day Thursday thirty expert operatives were at work. Dividing into six parties, the ruined territory was apportioned in districts, from which the plates were hurried to the dark rooms of J. C. Strauss's photographic plant, at No. 1427 Franklin avenue, developed, packed in specially prepared boxes and delivered to special messengers, who brought them to New York via the Big Four and the Pennsylvania Railroads. Our frontispiece shows a group of these scenes, from prints furnished the AMERICAN JOURNAL OF PHOTOGRAPHY by Photographer Strauss of St. Louis.

The Y or Z Rays Perhaps.—An amateur photographer out in Rochester has succeeded in making pictures without the assistance of any kind of light whatever. This is important if true. The mere matter of light upon a given subject has not always been a necessary thing as far as facts go, for now and then matters drift to the surface of the most astonishing character. But the season is here when the rayless kodak may puncture many a secret and lay bare what the darkness has long hidden from sight. Science is making wonderful strides forward, and promises an early unraveling of the mysteries of politics and the causes for the vigils of politicians. Some astonishing results wait upon the photographer who is not in need of light in the work of his camera.

Lantern Work as an Educational Factor.—The projecting lantern as an educational factor has come to stay. While Philadelphia teachers have been slow in adopting it as a means for illustrating the work in history, geography and language, yet now, when they have taken up the matter, they enter upon the work with their usual hearty enthusiasm and fine intelligence. It is an evidence of the splendid spirit of our public school teachers that so far the city has paid not one cent for the slides which are used for this illustrative work in the elementary schools. The teachers have shown their faith in it as an educational means by investing their money in it. The Board of Education has, however, provided a collection of slides for the use of the Normal School, and while the collection is small, it is well selected, and has been added to by members of the faculty at their own expense. The system of taking care of the slides, so that they may be instantly accessible, is interesting and is a scheme that will, without doubt, be widely employed in other schools. A series of sixty drawers are arranged in a case in the offices of the Principal of the Practice School. Each drawer is wide and deep enough to carry slides comfortably, and

to prevent them from slipping over each other when placed on edge, each drawer is divided into three compartments by means of two partitions. By these means it is possible to arrange the slides in sixty drawers of three compartments each, or one hundred and eighty compartments in all, thus allowing of a system of classification of great flexibility and simplicity. The name of each slide is registered on a card index, and this, together with the cross references, make it as easy to find a given slide on any subject as it is to find a book on a subject in a well-catalogued and well-arranged library.

Photographs as Evidence.—The hearing of the Senate Investigating Committee at Philadelphia, on June 26th, were enlivened by the introduction of the Citizen Municipal Association, of a series of instantaneous photographs, in their effort to show the interference by the police at the Municipal election in February last. These points were the result of snap shots taken from windows opposite the polling places. During the course of the hearing Charles W. Crane, of Trenton, a photographer, was asked to identify eight large photographs representing scenes on election day, last February, outside the polling place of the 16th division of the fifth ward. The views showed policemen standing on the steps of the polling booths and talking through an open window to persons inside. Mr. Crane said that before 7 o'clock in the morning he took his station at a second-floor window of a house just across the street, and he took the photographs at intervals during the day without anyone in the street being aware of his presence. W. F. Sidelinger, photographer, of 833 Arch Street, identified six or eight large photographs of scenes outside the polls of the 12th division of the Fifth ward, and William Shaffer, of 2816 Warnock Street, identified photographs of the 15th division polling place.

And Another One.—A dispatch from Iowa says that a young farmer in that state has been experimenting with the X-rays, and has found what he terms a Y-ray by means of which he is enabled to change in three hours' time a cheap piece of metal worth thirteen cents into one hundred and fifty-three dollars worth of pure gold. There is nothing new in this discovery. The same thing was done long before the X-rays were ever heard of. A "gold brick," worth no more than a dollar, has been sold for as much as five thousand dollars.

Photographic Scissors and Paste.

The New Calcium Carbide Works at Niagara Falls.—The new works of the Acetyline Light, Heat and Power Company, formerly the Calcium Carbide Company, are reported complete and in operation. The Niagara Falls Power Company supplies the electric power to drive the plant, 1000 horse-power being used. An alternating current is furnished at 2200 volts, and is transformed to 110 volts. The capacity of the works is five tons of calcium carbide per day. The building is divided into five principal parts—a crusher room, a furnace room, a transformer room, a storage room, and a laboratory. Coke and lime, in the proportion of 75 pounds of pure lime to 100 pounds of pure carbon, are separately crushed in a Dodge crusher and a rolling mill, the coke going through a 50-mesh sieve. They are then thoroughly mixed and conveyed by a screw conveyor and an elevator to the furnaces on the second floor. There are four crucibles in the furnace, each holding 800 pounds of mixture. The crucible forms one electrode, the carbon "pencil" the other. A few inches of ground coke are put in the crucible, and the carbon pencil is then let down on it, closing the electric circuit and making an arc of intensely high temperature. The carbon is gradually drawn up as the mixture is dumped in. The chemical action immediately begins, by which the calcium of the lime and the carbon of the coke unite to form calcium carbide. The mixture is allowed to remain in the crucible from three to eight hours, according to the amount of ingredients and the current. A mixture of 1750 pounds of lime and 1130 pounds of coke, making a total of 2880 pounds, will produce 2000 pounds of calcium carbide. The estimated cost is $23 per ton. The products of the factory is all to be shipped in air-tight drums to Pennsylvania.—*Engineering News.*

Chlorophyll is perhaps the most important coloring substance in the world, for upon this substance depend the characteristic activity of plants, the synthesis of complex compounds from carbon dioxide and water process, upon which the existence of all living things is ultimately conditioned. Only in a very few unimportant forms devoid of chlorophyll can the synthesis of complex from simple compounds or from the elements be accomplished. The function of chlorophyll may only be comprehended when its chief physical properties are under-

stood. These may be best illustrated if a solution of the substance is obtained by placing a gramme of chopped leaves of grass or geranium in a few cubic centimetres of strong alcohol for an hour. Such a solution will be of a bright, clear green color, and when the vessel containing it is held in such a manner that the sunlight is reflected from the surface of the liquid, it will appear blood-red, due to its property of fluorescence, that of changing the wave-length of the rays of light of the violet and of the spectrum in such a manner as to make them coincide with those of the red end. It is by examination of light which has passed through a solution of chlorophyll, however, that the greatest insight into its physical properties may be gained. If such a ray of such light is passed through a prism and spread out on a screen, it may be seen that there are several large intervals or dark bands in the spectrum. The rays of light which would have occupied these spaces have been absorbed by the chlorophyll, and converted into heat and other forms of energy. This energy is directly available to the protoplasm containing the chlorophyll, and by means of it the synthesis of complex substance may be accomplished.—*Appleton's Popular Science Monthly.*

The Code of Health.—The laws which relate to individual health may be concisely summed up as follows:

1. Breathe only pure air.
2. Drink only pure water.
3. Eat only pure food.
4. Take sufficient muscular exercise.
5. Preserve proper attitudes.
6. Discipline the mind by proper mental exercise.
7. Take proper rest and recreation and sufficient sleep.
8. Restrain the passions and govern the emotions.
9. Give attention to personal cleanliness.
10. Be temperate in all things.

To the man who will carefully and conscientiously observe all of those laws which relate to his physical health, nature vouchsafes, barring accidents, a long, comfortable life, free from a great share of the ills which come upon a large portion of mankind. A great share of the sicknesses, and even a large proportion of deaths, are unquestionably due to the violation of some of the plainest principles of health morality, and are wholly preventable. An eminent English sanitarian once remarked, "When a man dies of typhoid fever, somebody ought to be hanged." Somebody is clearly responsible for the annual

slaughter, for not less than one-third of all the sickness, and pretty nearly as large a proportion of the deaths. Let us each with soberness and consideration, ask the reaching question, "Is it I?"—*J. H. Kellogg, M.D., in Signs of the Times.*

Introducing Drugs Into the Body by Electricity.—The following is an account of an experiment of this character in the treatment of headache: Suppose the pain has its seat in the left side of the head. The foot on the opposite side of the body is bared and placed on a zinc plate, which is connected to the negative electrode of the source of the current. A wet sponge and a layer of starch are applied to the sole of the foot. The positive electrode is placed on the left temple, and on the plate connected thereto is placed the amount of morphia, or whatever drug it is desired to administer, and a direct current is sent through the body. When a drop of iodine is placed on the starch it changes the color of the starch to a deep blue or purple. Within a minute after the electrode is applied to the temple, the same change takes place on the starch under the foot as is produced by direct contact with iodine. The intensity of the color depends on the time the current is applied. There are none of the sensations usually accompanying the application of electricity to the head. A slight stinging sensation soon changes to numbness. The pain in the head disappears.—*Western Electrician.*

Cheap Things.—We don't want things because they are cheap. Cheapness is as often a curse as a blessing. If you get a hat for one dollar instead of two dollars, some one has had to make that hat cheaply. If you want a cheap country, go to India or Mexico, where men live on a few cents a day. Go and enjoy the "blessings" of those countries! Deliver us from and protect us against universal cheapness, should be our prayer. Cheap literature is as bad as anything that is too cheap. The "cheap" countries are poverty-stricken peoples, the high-priced ones are prosperous and progressive. The thing that is worth having is worth working for, paying for;—only the lazy lout wants things very cheap or for nothing at all.—*Trade Press.*

"**Color Blindness** is never fatal, is it, doctor?"

"Well I knew of an Irishman who mistook an orange ribbon for a green one, on St. Patrick's Day, and tied it in his coat."—*Indianapolis Journal.*

Society Notes.

The Photographic Society of Japan.—The annual meeting of the above-mentioned society, for the year ending May, 1896, was held at the College of Science, Imperial University, Tokyo, on Friday, the 22d inst., at 4.30 p.m. The secretaries being called on for their report, the following was read:

During the past year the society has been in a transition state, and has suffered to a certain extent in consequence. Though we have had few meetings and only one field day, there has probably been no year when the individual members have been more active than during the present one. Some of our members have carried on investigations and produced results which deserve a wide publication. The vital question whether we shall have a home of our own, after having been referred to a competent committee, seems now to be verging towards an affirmative conclusion, and should the plans, which are already anticipated, be carried out, we are in a way to increase even our old reputation.

The business part of the meeting having ended, the members and visitors moved into the large hall of the College, where Professor K. Yamakawa, Ph.B., Director of the College, gave a lecture on "X Rays." The demonstration went off with perfect success, and was of extreme interest. The lecture included a description of original investigations by Professor Yamakawa, concerning reflection and refraction of "X Rays."

The Royal Photographic Society will hold its forty-first annual exhibition under the patronage of Her Majesty the Queen and His Royal Highness the Prince of Wales, from the 28th of September to the 12th of November, 1896, in the gallery of the Royal Society of Painters in Water Colors, 5a Pall Mall east, London, S.W.

The exhibition will be inaugurated on Saturday, the 26th of September, by a private view, followed in the evening by a conversazione.

The exhibition will remain open daily (Sundays excepted) from Monday, the 28th of September, until Thursday, the 12th of November. It will also be open on Monday, Wednesday and Saturday evenings, when lantern slides may be shown.

Medals will be placed at the disposal of the judges. Exhibitors may state whether they wish their exhibits to go before the judges in the art or technical section, or both. The exhibition will be conducted according to the rules adopted at the conference of judges.

The undermentioned gentlemen have been selected by the members of the Society to act as judges, and have consented to serve: Art Section, F. P. Cembrano, Jun., Col. J. Gale, B. W. Leader, A.R.A., B. W. Storey, A.R.A., W. L. Wyllie, A.R.A.; Technical Section, Capt. W. de W. Abney, C.B., D.C.L., F.R.S., Chapman Jones, F.I.C., F.C.S., Andrew Pringle, F.R.M.S.

Foreign exhibitors are invited to contribute. They will not be charged for wall space. The Society will provide frames or portfolios during the exhibition for approved photographs.

Reception of Exhibits.—Exhibits sent by carrier must be carriage paid, and addressed to the Secretary, Royal Photographic Society, 12 Hanover Square, London, W., and must arrive on or before Wednesday, September 9th.

Removal of Exhibits.—Exhibits received in packing cases will be repacked and despatched as soon as possible after the close of the exhibition.

Particular attention is requested to the removal of exhibits on the day appointed. If not taken away then, considerable expense will be incurred in removing and warehousing. This expense will be charged to the exhibitor.

Blank entry forms and any other information respecting the exhibition, also nomination forms for membership, can be obtained from the assistant secretary of the Society, 12 Hanover Square, London, W.

CHAPMAN JONES, *Honorary Secretary.*

The International Photographic Exhibition (triennial) at Bristol.—The Council of the Bristol and West of England Amateur Photographic Association announce that the triennial international exhibition of photographs, apparatus, appliances and processes, will be held in the galleries of the Academy of Fine Arts, Queen's Road, Clifton, Bristol, to be opened on Monday, December 14th, 1896, continuing open till Saturday, January 23d, 1897. Apart from photographs for competition, the Council will esteem it a favor if those who have any interesting examples of the history and the progress of photography will kindly lend them for exhibition.

To any amateur camera club or society who have regular club or meeting rooms, the Bausch & Lomb Optical Company, of Rochester, N. Y., will send free of charge, express paid, one of their test charts for testing lenses, neatly and substantially framed in antique oak. This test chart is the best accurate and simple means of determining the actual optical value of a lens, and every society should have one.

Photographic Literature.

A Valuable Annual.—Jahrbuch fur Photographie und Reproductionstechnik, fur das Jahr 1896. Von Dr. Josef Maria Eder. Wilhelm Knapp, Halle a.S.

The present volume, the tenth of the series, even surpasses its predecessors. It is embellished with 155 illustrations in the text and 28 plates, consisting of specimens of the various processes allied to the photographic art-science — photographic, photo-mechanical and chromo-type. The contents consist of no less than sixty-five original contributions by some of the leading photographic authorities of Europe, covering almost every department of photographic science and research. The most valuable feature of the annual, however, consists in the resume by Dr. Eder of the progress made during the years 1894–95 in photography and the various reproduction processes. This report covers no less than 272 pages, and forms a veritable book of technical reference by itself.

Dr. Josef Eder is to be congratulated upon the current volume of his Annual, the typography of which is, as usual, up to the standard of the great photographic publishing house of Wilhelm Knapp at Halle a.S. There is, however, a great regret to be mentioned in connection with this excellent work, *i.e.*, that there is no English edition, as it should be in the hands of every English-speaking photographer.

Amateur photographers, mountain-climbers, and lovers of outdor sport generally, will all find attractive reading in a group of three articles on "Photography on the Heights" in *The Outlook's* annual Recreation number. "Photography in the Alps" is the subject of an article by Madame Gozzaldi, which is humorous as well as practically instructive; the famous explorer, Lieutenant Peary, relates some of his experiences on the Greenland Ice-Cap; while Mr. W. D. Lyman tells the story of last year's ascent of Mount Adams by the Mazama Club. Many fine pictures of mountain scenery in Switzerland, Greenland, and the Far West illustrate these articles. Ten cents. The Outlook Company, 11 Astor Place, New York.

A Golden Jubilee.—Our valued contemporary, the *Scientific American,* announces that it will issue a special number in honor of the fiftieth anniversary of its publication. It is expected that the circulation of this extraordinary issue will be between 150,000 and 200,000 copies.

Photographic Amusements, including a description of a number of novel effects obtainable with the Camera. By Walter E. Woodbury. New York: The Scovill & Adams Company, 1896.

This work is not intended as an instruction book in the art of photography, but it is intended to call the attention of the expert amateur to a number of novel and curious effects that are to be obtained by the aid of the camera, together with some instructive and interesting photographic experiments.

The work is largely modeled after the well-known "Photographischer Zeitvertreib," by the late Herman Schnauss. There is a wealth of illustration in the text which shows to what a surprising extent the prosaic camera may be applied to produce startling and comic effects. If you want to know just how much amusement can be gotten out of your camera, get the book.

Photographs.—How to make in fifteen different colors. G. Gennert, 24 and 26 East Thirteenth Street, New York. A neat pamphlet on the carbon process, for both single and double transfers. The pamphlet contains all information needed for a successful working of this beautiful process. To be had gratis at the office of the AMERICAN JOURNAL OF PHOTOGRAPHY, 1030 Arch Street, Philadelphia.

The Photographer's Magazine.—A prospectus has been issude giving notice of the publication of a new periodical under above title. The circular, which has reached us, claims a guaranteed circulation for the first month (June) of 10,000 copies. We do not know who are the promoters of this scheme, nor have we seen even a sample copy.

Do Women Know?—That a teaspoonful of powered borax added to cold starch will tend to give the linen an extra stiffness.

That banana peel will clean tan shoes as well as regular dressing.

That pole rings can be made to run easily by rubbing the pole with kerosene until thoroughly smooth.

That all rugs when shaken should be handled by the middle and not the ends.

That salt dissolved in alcohol will take out grease spots.

That rain water and white castile soap in a lukewarm suds are the best mixture in which to wash embroideries.

That moths dislike newspapers as much as the prepared tar paper.

That court-plaster should never be applied to a bruised wound.

That a very fine steel pen is best for marking with indelible ink.

Photograpic Hints and Formulæ.

Metol for Bromide Paper.—The following is a good metol developer for bromide paper:

No 2.	Metol	400 grs.
	Sodium sulphite	8 ozs.
	Potass. bromide	50 grs.
	Water to	80 ozs.
No 2.	Potass. carbonate	8 ozs.
	Water to	80 ozs.

For use mix one part of No. 2 with three parts of No. 1.

Sodium Hyposulphite in the Amidol Developer.—The author states that the addition of a small quantity of sodium hyposulphite to the amidol developer, as is the case when it is added to ferrous oxalate, increases its reducing power very greatly. When a large quantity of hyposulphite is added, however, it does not bring on fog as with ferrous oxalate, but weakens the developing power of the solution. A plate was cut in two, and half developed with plain amidol developer made up as follows:

Amidol	2 parts.
Sodium sulphite	20 "
Distilled water	400 "

and then diluted with three times its bulk of water, and a little potassium bromide added. One drop of a ten per cent. solution of hyposulphite added to such a developer rendered it very vigorous. Its action was made more energetic on the addition of hyposulphite as far as three drops, but did not alter when this amount was increased to twelve, but on still further addition of hyposulphite, the appearance of the image was delayed, and the developer became weaker. Little difference resulted from the hyposulphite being acid or not, and from it being added at the commencement of the development or when the image had begun to appear.

Glittering Objects to Photograph.—The nature of the difficulty of each case varies very much. The first thing to be done is to try and avoid the glitter by rearranging the direction of light. This may often be done when dealing with small and movable objects, glass and china curios, silver plate, ivories, cameos, etc. Or sometimes it is enough to hang up a sheet of the thinnest tissue between the window and the objects. At other times the object may be a fixture,

and only one direction of light available, *e.g.*, machinery in a room. If softening and diffusing the light is not sufficient, then the glittering parts must be dulled. Dabbing putty on them is often sufficient for the purpose. Or a very thin shower of whiting in a fine powder will answer. The whiting or prepared chalk is finely ground, tied up in two thicknesses of fine muslin, and tapped with a stick, so causing a cloud of the whiting to fly about and settle on the glittering parts. If the objects are brightly polished silver or gold, etc., vessels, sometimes it is possible to obtain pieces of ice to put into them. This quickly brings down the temperature, and so causes to condense on their surface a fine covering of minute dew-drops, so giving them a frosted appearance.

Retouching Pencil, to Sharpen.—It is often a great convenience to have several retouching pencils at hand, of varying degrees of hardness, and with different kinds of points. Perhaps the best method of obtaining any desired kind of point (from blunt, fine, sharp, broad, etc.) is to have at hand a piece of rough, of medium, and of fine sandpaper, and also a small strip of rather coarse ground glass; with this choice of rubbers any kind of point can be quickly obtained. A scratchy point is always to be avoided. The finest work can be done with a long, tapering point, which never need be scratchy. When using these sharpening rubbers, keep the pencil constantly turning round and round between the fingers.

Contrast, Exposure and Development.—*Slow exposure* tends to emphasize contrast of light and shade, resulting in a hard negative.

Over-exposure tends to reduce contrast, and yields a soft or flat negative.

Quick development tends to reduce contrast.

Slow development tends to delicacy and detail, with longer scale of gradation.

Quick development may be brought about by warming developer, concentration, or excess of alkali.

Slow development may be the result of a low temperature, dilution, or very little alkali and excess of bromide.

Stopper, to Unloose.—Happy is the reader who has never been bothered by an obstinate stopper, *i.e.*, one that obstinately persists in stopping in the bottle neck when we want it to come out. Should this trouble arise, there are several courses open to us:

First try to remove the stopper by a screwing sort of motion, first one way and then another.

Next wrap a bit of rag round the stopper and try again the screwing motion.

Thirdly.—Place the bottle on the table, seize the neck with the left hand so that the ball of the thumb is against one edge of the stopper. With the other hand *gently* tap the stopper in an *upward* direction and opposite to the upward push of the left-hand thumb. For this purpose we must employ *not* a hammer or knife, but some yielding substance, *i.e.*, a piece of wood, *e.g.*, foot-rule, paper knife, tool handle; or the edge of the sole of a slipper is a very safe thing to use. If too much force or a non-yielding substance be used, the chances are that the stopper will be broken. If the hand be warm and the neck grasped by the hand, the warmth so imparted is a material assistance, as it causes the neck to expand and so loosen the stopper. Therefore persevere with this method for a minute or two, trying first one side and then another.

Fourthly.—Tie to some firm object, *e.g.*, leg of table, knob of drawer, etc., one end of a stout, *smooth* piece of string; take the other end of string in left hand, pass the string once round the neck of the *bottle*, now hold in the right hand, and pass the bottle quickly to and fro so that the friction of the string heats the bottle neck. Every few minutes stop and try the third method. These two methods very seldom fail if sufficient patience is also employed.

Fifthly.—The heating method may be employed in another way—by holding the neck under the kitchen hot water tap and letting a quick stream of hot drops fall on it, the bottle being constantly turned round all the time. The water must not be too hot at first.

Sixthly.—Should all the above devices fail, the solution method may be tried. This consists of dissolving the substance which has got in between the stopper and the bottle neck and formed a cement. The solvent must, of course, depend upon the nature of the contents of the bottle. The best thing to try first when the bottle contains a liquid is some of the same liquid that it contains. For instance, a saturated solution of sodium sulphite often fixes its stopper, but if the bottle be inserted in a vessel containing water, some of it will probably penetrate between the stopper and neck, and so dissolve the salt precipitated by evaporation. In the case of varnishes, etc., such solvents as benzole, turpentine, alcohol, chloroform may be tried. Paraffin is a good penetrator in many cases.

To prevent stoppers sticking, it is a good plan (when the contents of the bottle do not forbid it) to rub the stopper with a bit of warm paraffin, wax, or vaseline, and then remove all the superfluous wax, etc.

Roentgen Ray Notes.

Deflection of the X rays by a Magnet.—The long-sought deflection of the Roentgen rays by an electro-magnet has at last been produced and observed by a Frenchman, M. A. Lafay. The rays were passed between the poles of an electro-magnet capable of generating a very powerful magnetic field. With the aid of a sensitive plate exposed opposite a narrow slit in a lead plate, he was able to obtain unmistakable evidence of deflection at a distance of fifteen centimetres. This deflection was in the same direction as would be the case with the cathode rays.

A Damaged Vertebra Shown in Detail and a Murphy Button Located.—Dr. Oliver Lodge, the well known English electrical authority, states in the *London Times* that he and his co-workers have succeeded in radiographing the details of a damaged vertebra in the spine of an adult patent at the Northern Hospital, Liverpool, with an exposure of half an hour, and found a Murphy button in the intestine of another adult at the Liverpool Royal Infirmary with an exposure of ten minutes.

Had the Fluoroscope Handy.—Louis W. Buckley, the manager of the exhibition department of the Bourse, who has just returned from the electrical exhibition in New York, relates quite an incident which happened while he was there.

While at the exposition, Mr. Buckley spent a great deal of time with the electrical wizard, Thomas A. Edison, who has a dark room in the building for the purpose of exhibiting his lately-perfected fluoroscope.

One day a burglar was detected trying to break into a store near the exposition building and was pursued by a policeman. When commanded to halt he did not do so, but was quickly brought to a stop by a bullet from the policeman's revolver.

When it was found that the thief was wounded the physicians probed for the bullet, but they were unable to find it. Then a happy thought occurred to them. Why not let Mr. Edison turn the X rays on him and find it. No sooner thought of than done. Picking the man up, they hurried him into the exposition building and into Mr. Edison's dark room.

Here Mr. Edison demonstrated practically the great value of the fluoroscope, and the bullet was speedily removed.

In the Twilight Hour.

SIN never looks in the glass.

LOVE is not afraid of giving too much.

THE devil does not like a mirror or a street lamp.

HE s a wise man who does not know enough to take a slight.

A HOMELY face appears as well as a handsome one in the dark.

THE best way to rid a field of weeds is to sow it thick with good seed.

WE prove our fitness for a better world when we help make this world better.

IF you say "Good Morning" to the devil he will spend the day with you.—*Ram's Horn.*

SIN could not get within ten blocks of a child if it had to go undisguised and in broad daylight.

NOTHING so pleases Satan as to have churches quarrel over water and keep still about whiskey.

ONLY he who puts on the garment of humility, finds how worthily it clothes him.—*Phillips Brooks.*

WHISKEY is now being made from old rags. It is a simple process of inversion, as whiskey has been the chief manufacturer of rags.—*Ram's Horn.*

DO THE good you know. Follow the light you see. Be true to the truth revealed. Not wishing, or feeling, or empty resolves, but being and doing is the key to faithful living.

GOODNESS is greatness.

WORKS tell more than words.

A HOLY act is a seed of life growing into greater life and fruitfulness.

ANSWER doubts with deeds; the best proof of Christianity is the faithful living of its professors.

THERE is no fit search after truth which does not, first of all, begin to live the truth which it knows.

SPIRITUAL labors have peculiar solace and refreshment; yet they are, or ought to be, severe and exhausting.

THE more we sit at his feet and watch to see what He has to say to ourselves, the more we shall have to tell others.

LET young men make themselves ready for positions of trust, and they will be called to the positions at the right time.

OBSERVE what direction your thoughts and feelings most readily take when you are alone, and you will then form a tolerably correct opinion of your real self.—*Bengel.*

THERE is no conceivable limit to the soul's possibilities that has once resolved with a resolution that cannot be shaken to be true to itself and to the ideal that God sets before it.

HE who is poor because he stands true to God and his duty, is poor only as the sower is impoverished, who casts the wheat into the furrow, and then waits for the sheaves of harvest.